

**Notic of Allowability**

Application No.

10/047,044

Examiner

Robert M Kunemund

Applicant(s)

DAHL ET AL.

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1765

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to December 18, 2003.
2. ☒ The allowed claim(s) is/are 59-63, 66-88 and 90-95.
3. ☒ The drawings filed on 12 January 2002 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Claims 1 to 58 (canceled)

59. (previously presented) A method of nucleating the growth of a diamond film, wherein the film is nucleated with at least one higher diamondoid.
60. (original) The method of claim 59, wherein the higher diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane.
61. (previously presented) A method of nucleating the growth of a diamond film, the method comprising the steps of:
- a) providing a reactor having an enclosed process space;
  - b) positioning a substrate within the process space;
  - c) introducing a process gas into the process space;
  - d) coupling energy into the process space from an energy source; and
  - e) injecting at least one higher diamondoid into the process space, wherein the at least one higher diamondoid nucleates the growth of the diamond film on the substrate.
62. (previously presented) The method of claim 61, wherein the reactor is configured to carry out a chemical vapor deposition (CVD) technique.
63. (previously presented) The method of claim 62, wherein the chemical vapor deposition technique is a plasma enhanced chemical vapor deposition (PECVD) technique.

64. (canceled)

65. (canceled)

66. (previously presented) The method of claim 61, wherein the at least one higher diamondoid is a substituted higher diamondoid.

67. (previously presented) The method of claim 61, wherein the nucleation is independent of the nature of the substrate.

68. (previously presented) The method of claim 61, wherein the substrate is a carbide forming substrate.

69. (previously presented) The method of claim 68, wherein the substrate is selected from the group consisting of Si and Mo.

70. (previously presented) The method of claim 61, wherein the substrate is a non-carbide forming substrate.

71. (previously presented) The method of claim 70, wherein the substrate is selected from the group consisting of Ni and Pt.

72. (previously presented) The method of claim 61, wherein the process gas comprises methane and hydrogen.

73. (previously presented) The method of claim 72, wherein the process gas further includes an inert gas.

74. (previously presented) The method of claim 73, wherein the inert gas is argon.

75. (previously presented) The method of claim 61, wherein the energy source comprises an induction coil such that the power coupled into the process space generates a plasma.

76. (previously presented) The method of claim 72, further including the step of converting the hydrogen within the process space to monoatomic hydrogen.

77. (previously presented) The method of claim 61, wherein the injecting step comprises volatilizing the at least one higher diamondoid by heating such that it sublimates into the gas phase.

78. (previously presented) The method of claim 77, wherein the injecting step includes entrainment of the sublimed higher diamondoid in a carrier gas which is introduced into the process chamber.

79. (previously presented) The method of claim 78, wherein the carrier gas is at least one gas selected from the group consisting of hydrogen, nitrogen, an inert gas, and a carbon precursor gas.

80. (previously presented) The method of claim 79, wherein the inert gas is a noble gas, and wherein the carbon precursor gas is at least one gas selected from the group consisting of methane, ethane, and ethylene.

81. (previously presented) The method of claim 61, wherein the nucleation rate of the ~~diamondoid~~ diamond film ranges from about  $10^4$  to  $10^{10}$   $\text{cm}^{-2} \text{s}^{-1}$ .

82. (previously presented) The method of claim 61, wherein the injecting step allows carbon atoms to be deposited on the substrate 10 or more atoms at a time.

83. (previously presented) The method of claim 61, wherein the injecting of the at least one higher diamondoid increases the growth rate of the diamond film by a factor of at least two to three times.

84. (previously presented) The method of claim 61, wherein the injecting of the at least one higher diamondoid increases the growth rate of the diamond film by at least an order of magnitude.

85. (previously presented) The method of claim 61, wherein the injecting of the at least one higher diamondoid occurs at the beginning of a deposition process.
86. (previously presented) The method of claim 61, wherein the injecting of the at least one higher diamondoid occurs during at least part of the growth of the diamond film.
87. (previously presented) The method of claim 61, further including the step of selecting a particular higher diamondoid to facilitate the growth of a diamond film having a desired crystalline orientation.
88. (previously presented) The method of claim 61, wherein the substrate is rotated during at least a part of the growth of the diamond film.
89. (canceled)
90. (previously presented) A diamond film nucleated by at least one higher diamondoid.
91. (previously presented) A diamond film nucleated by the steps comprising:
  - a) providing a reactor having an enclosed process space;
  - b) positioning a substrate within the process space;
  - c) introducing a process gas into the process space;
  - d) coupling energy into the process space from an energy source; and
  - e) injecting at least one higher diamondoid into the process space, wherein the at least one higher diamondoid nucleates the growth of the diamond film on the substrate.
92. (previously presented) The diamond film of claim 90, wherein the diamond film is an ultrananocrystalline film.

93. (previously presented) The diamond film of claim 92, wherein the ultrananocrystalline film has a microstructure comprising a three to five nanometer crystallite size.

94. (previously presented) The diamond film of claim 90, wherein the higher diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane.

95. (previously presented) The diamond film of claim 91, wherein the higher diamondoid is selected from the group consisting of tetramantane, pentamantane, hexamantane, heptamantane, octamantane, nonamantane, decamantane, and undecamantane.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert M Kunemund whose telephone number is 571-272-1464. The examiner can normally be reached on 8 hours.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RMK



ROBERT KUNEMUND  
PRIMARY EXAMINER